

HIGH OUTPUT HIGH EFFICIENCY LOW VOLTAGE CHARGE PUMP

Abstract of the Disclosure

The charge pump circuit includes an oscillator to generate an oscillating signal. The charge pump circuit further includes a primary phase generator, which receives the oscillating signal and generates first and a second phase signals that are non-overlapping and crossing around their high points. The primary phase generates further generates third and fourth phase signals that non-overlapping and crossing around their low points. The charge pump circuit further includes a secondary phase generator, which receives the first and second phase signals from the primary phase generator and generates delayed fifth and sixth phase signals. The charge circuit further includes first and second pre-boot precharge capacitors, which receive the first and second phase signals. The charge circuit further includes first and second pre-boot capacitors, which receive the first and second phase signals, and is further precharged by the first and second pre-boot precharge capacitors respectively during a first phase and a second phase respectively to a first pre-determined level. The charge pump further includes first and second main pump precharge capacitors, which receive the first and second phase signals from the primary phase generator during the first and second phases respectively. The charge pump circuit further includes first and second main pump capacitors for outputting the charge. According to one embodiment, the charge pump is generally prebooting one of the main pump capacitors to a predetermined boot level, while it is outputting the charge from the other main pump capacitor. As a result, the pre-boot time is hidden during a charge out. This enables the charge pump to run at a faster cycle time which can result in a higher output. This can also enable the charge pump to produce more charge for a given size of a capacitor.

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